

## REMARKS

In an Office Action mailed February 22, 2008, the Examiner made the following rejections:

1. Claims 29-46 were rejected under 35 U.S.C. 112, second paragraph;
2. Claims 1 and 5-6 were rejected under 35 U.S.C. § 102(a) over Applicant's admitted prior art.
3. Claims 29-30 were rejected under 35 U.S.C. 102(e) over U.S. Patent No. 7,035,595 (Kim).
4. Claim 2 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent No. 7,016,654 (Bugeja).
5. Claim 3 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent Publication No. 2002/0177423 (Cowley).
6. Claim 4 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent No. 6,177,964 (Birlson).
7. Claims 18 and 20 were rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent No. 4,361,906 (Sakamoto) and further in view of U.S. Patent Publication No. 2005/0239499 (Oosawa).
8. Claim 19 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of Sakamoto, Oosawa, and U.S Patent No. 6,711,149 (Yano).
9. Claims 21 and 25 were rejected under 35 U.S.C. 103(a) over the admitted prior art in view of Sakamoto.

10. Claims 13 and 22 were rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent No. 5,251,218 (Stone).
11. Claims 23 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of Stone and further in view of WO 97/06604 (Hedstrom).
12. Claim 24 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of Stone and further in view of Hedstrom and Birlson.
13. Claims 7 and 27-28 were rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent Publication No. 2001/0041532 (Tomasz).
14. Claim 31 was rejected under 35 U.S.C. 103(a) over Kim in view of Cowley.
15. Claims 38 and 40 were rejected under 35 U.S.C. 103(a) over Kim in view of Sakomoto and further in view of Oosawa.
16. Claim 39 was rejected under 35 U.S.C. 103(a) over Kim in view of Sakomoto and further in view of Oosawa and Yano.
17. Claim 41 was rejected under 35 U.S.C. 103(a) over Kim in view of Sakomoto.
18. Claim 42 was rejected under 35 U.S.C. 103(a) over Kim in view of Sakomoto and further in view of Hedstrom.
19. Claims 34-36 were rejected under 35 U.S.C. 103(a) over Kim in view of U.S. Patent Publication No. 2003/0083033 (Staszewski).
20. Claim 37 was rejected under 35 U.S.C. 103(a) over Kim in view of Stone.
21. Claim 43 was rejected under 35 U.S.C. 103(a) over Kim in view of Tomasz and further in view of Sakamoto.

22. Claim 44 was rejected under 35 U.S.C. 103(a) over Kim in view of Sakomoto and further in view of Staszewski.

23. Claims 33 and 45-46 were rejected under 35 U.S.C. 103(a) over Kim in view of Tomasz.

Applicant addresses these arguments below in view of the foregoing amendments, and respectfully requests the reconsideration of claims 1-46 and the allowance thereof, thereby placing the application in condition for allowance.

1. Claims 29-46 were rejected under 35 U.S.C. 112, second paragraph. Applicant notes that the antecedent for “the radio frequency signal” is “the analog radio frequency signal” referred to earlier in claim 29, as amended. Applicant also amends claims 31, 32, 34, 35, and 38 to update “the radio frequency signal” accordingly.
2. Claims 1 and 5-6 were rejected under 35 U.S.C. § 102(a) over Applicant’s admitted prior art. Applicant notes however that claim 1 recites “a direct digital frequency synthesizer having *an output terminal for providing a digital local oscillator signal*” and “a mixer having . . . a second input terminal coupled to *the output terminal of the direct digital frequency synthesizer*” (emphasis added). This is different from Applicant’s admitted prior art of FIG. 2. Notice that in FIG. 2, DAC 84 converts the output of DDFS 82 into an analog local oscillator signal and provides this analog signal to the second input of mixer 86. Thus, the mixing signal exists as an actual signal at frequency  $f_{LO}$  that can radiate around the chip and mix with other signals conducted on other signal lines, creating unwanted locking and spurs. Applicant recognized this problem and the advantage of using the digital output of a DDFS to drive a mixer. See, for example, paragraph [0051]: “This architecture of the present invention solves this problem because the LO mixing signal never exists as a physical signal on any circuit node, but rather exists as a collection of digital bits”, and later in paragraph [0074]: “Since there is no circuit node that contains an actual oscillator signal, as there would be with a conventional LC oscillator, there is no mechanism for the local oscillator signals to leak or radiate into other circuits, causing unwanted locking or spurs.”
3. Claims 29-30 were rejected under 35 U.S.C. 102(e) over U.S. Patent No. 7,035,595

(Kim). Note however that Kim, like Applicant's admitted prior art in FIG. 2, uses a digital synthesizer 207 to drive a local oscillator 205 to form an analog local oscillator signal, and to mix the RF signal in mixers 206 using the analog local oscillator signal. See Kim at col. 4, lines 2-6. Unlike the invention of claim 29, the mixing signal in Kim exists as an actual signal that can radiate around the chip and mix with other signals conducted on other signal lines, creating unwanted locking and spurs. See also the comments in paragraph 2 above.

4. Thus, Kim fails to show or suggest a step of "mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency" as recited in claim 29.
5. Claim 2 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent No. 7,016,654 (Bugeja). However Bugeja also fails to show or suggest "a direct digital frequency synthesizer having an output terminal for providing a digital local oscillator signal" and "a mixer having . . . a second input terminal coupled to the output terminal of the direct digital frequency synthesizer". Thus claim 2 is not shown or suggested by the combination of the admitted prior art and Bugeja for at least this reason as well.
6. Claim 3 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent Publication No. 2002/0177423 (Cowley). However Cowley also fails to show or suggest "a direct digital frequency synthesizer having an output terminal for providing a digital local oscillator signal" and "a mixer having . . . a second input terminal coupled to the output terminal of the direct digital frequency synthesizer" as recited in base claim 1. Thus claim 2 is not shown or suggested by the combination of the admitted prior art and Cowley for at least this reason as well.
7. Claim 4 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent No. 6,177,964 (Birlson). However Birlson also fails to show or suggest "a direct digital frequency synthesizer having an output terminal for providing a digital local oscillator signal" and "a mixer having . . . a second input terminal coupled to the output terminal of the direct digital frequency synthesizer" as recited in base claim 1. Thus claim 4 is not shown or suggested by the combination of the admitted prior art and Birlson for at least this reason as

well.

8. Claims 18 and 20 were rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent No. 4,361,906 (Sakamoto) and further in view of U.S. Patent Publication No. 2005/0239499 (Oosawa). However neither Sakamoto nor Oosawa show or suggest “a direct digital frequency synthesizer having an output terminal for providing a digital local oscillator signal” and “a mixer having . . . a second input terminal coupled to the output terminal of the direct digital frequency synthesizer” as recited in base claim 1. Thus claims 18 and 20 are not shown or suggested by the combination of the admitted prior art and Sakamoto and Oosawa for at least this reason as well.

9. Claim 19 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of Sakamoto, Oosawa, and U.S Patent No. 6,711,149 (Yano). However neither Sakamoto, Oosawa, nor Yano show or suggest “a direct digital frequency synthesizer having an output terminal for providing a digital local oscillator signal” and “a mixer having . . . a second input terminal coupled to the output terminal of the direct digital frequency synthesizer” as recited in base claim 1. Thus claim 19 is not shown or suggested by the combination of the admitted prior art and Sakamoto, Oosawa, and Yano for at least this reason as well.

10. Claims 21 and 25 were rejected under 35 U.S.C. 103(a) over the admitted prior art in view of Sakamoto. However Sakamoto does not show or suggest “a direct digital frequency synthesizer having an output terminal for providing a digital local oscillator signal” and “a mixer having . . . a second input terminal coupled to the output terminal of the direct digital frequency synthesizer” as recited in base claim 1. Thus claims 21 and 25 are not shown or suggested by the combination of the admitted prior art and Sakamoto for at least this reason as well.

11. Claims 13 and 22 were rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent No. 5,251,218 (Stone). However Stone does not show or suggest “a direct digital frequency synthesizer having an output terminal for providing a digital local oscillator signal” and “a mixer having . . . a second input terminal coupled to the output terminal of the direct digital frequency synthesizer” as recited in base claim 1. Thus claims

13 and 22 are not shown or suggested by the combination of the admitted prior art and Stone for at least this reason as well.

12. Claims 23 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of Stone and further in view of WO 97/06604 (Hedstrom). However Hedstrom does not show or suggest “a direct digital frequency synthesizer having an output terminal for providing a digital local oscillator signal” and “a mixer having . . . a second input terminal coupled to the output terminal of the direct digital frequency synthesizer” as recited in base claim 1. Thus claim 23 is not shown or suggested by the combination of the admitted prior art and Hedstrom for at least this reason as well.

13. Claim 24 was rejected under 35 U.S.C. 103(a) over the admitted prior art in view of Stone and further in view of Hedstrom and Birlson. However neither Hedstrom nor Birlson shows or suggests “a direct digital frequency synthesizer having an output terminal for providing a digital local oscillator signal” and “a mixer having . . . a second input terminal coupled to the output terminal of the direct digital frequency synthesizer” as recited in base claim 1. Thus claim 24 is not shown or suggested by the combination of the admitted prior art and Hedstrom and Birlson for at least this reason as well.

14. Claims 7 and 27-28 were rejected under 35 U.S.C. 103(a) over the admitted prior art in view of U.S. Patent Publication No. 2001/0041532 (Tomasz). However Tomasz does not show or suggest “a direct digital frequency synthesizer having an output terminal for providing a digital local oscillator signal” and “a mixer having . . . a second input terminal coupled to the output terminal of the direct digital frequency synthesizer” as recited in base claim 1. Thus claims 7 and 27-28 are not shown or suggested by the combination of the admitted prior art and Tomasz for at least this reason as well.

15. Claim 31 was rejected under 35 U.S.C. 103(a) over Kim in view of Cowley. However Cowley also does not show or suggest a step of “mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency” as recited in base claim 29. Thus claim 31 is not shown or suggested by the combination of Kim and Cowley for at least this reason as well.

16. Claims 38 and 40 were rejected under 35 U.S.C. 103(a) over Kim in view of Sakamoto and further in view of Oosawa. However neither Sakamoto nor Oosawa shows or suggests a step of “mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency” as recited in base claim 29. Thus claims 38 and 40 are not shown or suggested by the combination of Kim, Sakamoto, and Oosawa for at least this reason as well.

17. Claim 39 was rejected under 35 U.S.C. 103(a) over Kim in view of Sakamoto and further in view of Oosawa and Yano. However neither Sakamoto, Oosawa, nor Yano shows or suggests a step of “mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency” as recited in base claim 29. Thus claim 39 is not shown or suggested by the combination of Kim, Sakamoto, Oosawa, and Yano for at least this reason as well.

18. Claim 41 was rejected under 35 U.S.C. 103(a) over Kim in view of Sakamoto. However Sakamoto also does not show or suggest a step of “mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency” as recited in base claim 29. Thus claim 41 is not shown or suggested by the combination of Kim and Sakamoto for at least this reason as well.

19. Claim 42 was rejected under 35 U.S.C. 103(a) over Kim in view of Sakamoto and further in view of Hedstrom. However neither Sakamoto nor Hedstrom shows or suggests a step of “mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency” as recited in base claim 29. Thus claim 42 is not shown or suggested by the combination of Kim, Sakamoto, and Hedstrom for at least this reason as well.

20. Claims 34-36 were rejected under 35 U.S.C. 103(a) over Kim in view of U.S. Patent Publication No. 2003/0083033 (Staszewski). However Staszewski does not show or suggest a step of “mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency” as recited in base claim 29. Thus claims 34-36 are not shown or suggested by the combination of Kim and Staszewski for at

least this reason as well.

21. Claim 37 was rejected under 35 U.S.C. 103(a) over Kim in view of Stone. However Stone does not shows or suggest a step of “mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency” as recited in base claim 29. Thus claim 37 is not shown or suggested by the combination of Kim and Stone for at least this reason as well.

22. Claim 43 was rejected under 35 U.S.C. 103(a) over Kim in view of Tomasz and further in view of Sakamoto. However neither Tomasz nor Sakamoto shows or suggests a step of “mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency” as recited in base claim 29. Thus claim 43 is not shown or suggested by the combination of Kim, Tomasz, and Sakamoto for at least this reason as well.

23. Claim 44 was rejected under 35 U.S.C. 103(a) over Kim in view of Sakamoto and further in view of Staszewski. However neither Sakamoto nor Staszewski shows or suggests a step of “mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency” as recited in base claim 29. Thus claim 44 is not shown or suggested by the combination of Kim, Sakamoto, and Staszewski for at least this reason as well.

24. Claims 33 and 45-46 were rejected under 35 U.S.C. 103(a) over Kim in view of Tomasz. However Tomasz does not show or suggest a step of “mixing the analog radio frequency signal with the digital local oscillator signal to provide an analog output signal at the desired frequency” as recited in base claim 29. Thus claims 33 and 45-46 are not shown or suggested by the combination of Kim and Tomasz for at least this reason as well.

## CONCLUSION

In view of the foregoing amendments, Applicant respectfully requests the reconsideration of the rejection of claims 1-46 and withdrawal thereof, thereby placing the application in condition for allowance.

The Commissioner is hereby authorized to charge any fees that may be required, or credit any overpayment, to Deposit Account Number 50-3797.

Respectfully submitted,

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